

Linking holistic and reductionistic approaches: teaching of the undergraduate subject *Introduction to Ecological Agriculture*

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Learning about sustainable agriculture and its holistic ecological management is the principal focus of the 3-year full-time transdisciplinary course *Bachelor of Ecological Agriculture* (BEcoAg) (*Bachelor of Ecological Agricultural Systems* from 2010) offered at Charles Sturt University ([CSU], Orange campus, NSW, Australia). In 1998–1999, when the Orange university campus was a part of the University of Sydney, major efforts were made to convince biological and empirical ecologists (members of the Academic Senate) on the vitality and vibrancy of BEcoAg. In 2000, BEcoAg was approved and launched in Orange campus. Arguments presented in its defence have been published (Raman et al., 2004; Cochrane et al., 2007).

BEcoAg achieves its transdisciplinary focus by teaching subjects from both hard and soft sciences in addition to sociological subjects such as *Human Ecology* marshalling on systems approach. The course is reinforced through the Capability Portfolio (Cochrane et al., 2002), wherein learners relate their learning achieved, while studying 24 subjects over three years, with the seven graduate capabilities (Stephenson & Weil, 1992). In the portfolio, learners document their learning in a journal – from what they perceived at the start to what they achieved at the end of the course – in the wise management of agriculture set within a Nature–human relations context (Kahn, 1999; Bourdeau, 2004). In such a reflective learning environment, learners contextualize their academic learning in a framework, which the industry deems vital for graduates for employment. [Note: The Capability Portfolio in CSU's undergraduate courses in Orange is under review presently.]

The principle

Debates on the values of holistic and reductionistic approaches have dominated human minds for long, especially from the start of 20th century (Anderson, 2002). The paradigm shift enshrined in BEcoAg is echoed in Boyd (1974: p 52):

"... that understanding begins ... with respect for ... all the creatures and the plants and even the rocks and the minerals. All things have their own will and their own way and their own purpose; this is what is to be respected. Such a respect is not a feeling or an attitude only. It's a way of life. Such respect means that we never stop realizing and never neglect to carry out our obligation to ourselves and our environment: to work together to make life good for all of us, all who live upon this Mother Earth".

The driving principle of BEcoAg is valuing holism as a comprehensive worldview that encompasses both ontological and epistemological perspectives. Nonetheless, during conceptualization, we could not dispense with reductionistic worldview, because BEcoAg is a management-based course, and

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therefore mandatorily relies on science and scientific processes. An effective fusion of the two apparently conflicting worldviews was considered vital. Stimulation of holistic thinking embedded within measured doses of reductionistic practice was determined as the way forward. The subject *Introduction to Ecological Agriculture* (IEA: AGR 141) was developed as the first core subject seated within the above framework.

IEA pedagogy

The foundation was that the learner experience in *IEA* should be an intellectual experiential journey. The focus of that learning journey was to enable learners to gain an understanding of agricultural practice in the context of ecological theory. The flag posts were ecological concepts and learning to apply them appropriately in agricultural management in the ambience of ethically driven arguments. *IEA* was developed in such a way that the learners, while undertaking their journey, would recognize and accommodate their emotions and respond to moral sensitivity by conducting a comparative historical and experiential exploration of various forms of agriculture practiced throughout the world. This exploration includes a serious consideration of the obvious divergence in the Western and Eastern practices. The journey is to enable learners to gain a first-hand experience of a variety of agricultural practices, as available locally: learners not only observe, but also experience contrasting patterns of land use in agriculture. Their journey, from that point, would move in a direction exploring the history of agriculture and environmental issues that have arisen because of industrialized agriculture underpinning the conceptual clarity of ecocentric and technocentric paradigms (O'Riordon, 1981). Learners develop their personal stance on the theme of sustainability in agriculture and its ecological management. A component added recently in the teaching schedule, based on student feedback, is the exploration of relationships between agriculture and society in the framework of environmental economics.

Online-forum debates challenge learners on the limits of sustainability and sustainable agriculture. Pointers posed in the forum provoke learners to reflect on and debate the issue of anthropocentricity that craftily controls sustainability and sustainable agriculture, at the same time valuing the economically driven environmental benefits provided by sustainable practices. The influence of anthropocentricity on sustainability is discussed at length although learners are encouraged to reach individual conclusions.

IEA aims at validating the original position of *Homo sapiens* within the larger context of Nature and its relationship with the remainder: the living and non-living. The reason for this aim is that we, humans, work instinctively towards achieving 'natural productivity' (Savulescu & Bostrom, 2009). The other aim of *IEA* is to highlight the position of the human species in the overall scheme of Nature and its complex processes. While validating the criticality of agriculture as a process for the survival of human race, the dominating position of the human will be the fulcrum for discussions.

Because *IEA* is a 'Year 1—Semester 1' subject, expected prior knowledge of either ecology or agriculture is nil, except what would have been learnt as part of high-school science. However, a key expectation is that learners should be familiar with the current environmental, ecological, agricultural, and related social issues of the region they come from and be generally familiar with similar issues from across the world, by obtaining information through mass media and personal professional contacts. The subject has been modularized to homogenize the depth of context and the breadth of contents. Themes in Module 1 capture the evolution of agricultural phenomenon over time, and how the environmental onslaught commenced in Europe with the Industrial Revolution and its ramifications in agricultural practice; those in Module 2 refer to natural-

ecological theory as relevant to agricultural practice; and those in Module 3 lead learners to a different plane enabling them to compare and contrast different philosophical responses to agriculture-triggered environmental problems existing in contemporary society and to explore themes that pertain to Nature-human relations.

Assessment tasks have been constructively aligned (Biggs, 1996) with these modules, enabling learners to learn in a phased manner and demonstrate their learning through their periodic reflections on both in-farm and out-of-farm experiences. The final assessment task requires that each learner independently evaluates the merits of ecocentric contrasted against technocentric perspectives relevant to agriculture in general and sustainable agriculture in particular. The vital dimension in the last assessment task is that each learner would articulate his/her personal reflective statement (2–3 pages) of his/her intellectual journey through *IEA* in the context of ecocentric—technocentric paradigms.

Reductionism—holism linkage: the novelty

Design of *IEA* flexibly enables learners to dive at different depths and swim at different breadths in achieving their learning. To realize that level of different depths and breadths, a connection between principles of empirical science (reductionistic discipline) and abstract philosophy (holistic discipline) has been integrated aiming at nurturing both logical and free thinking in learners.

The novelty of linking reductionistic and holistic approaches rests on the premise that learning natural-ecological theory is critical to manage agriculture sustainably (e.g., themes in Module 2). Learners gain an understanding of the way in which species, populations, communities, ecosystems, and landscapes operate, by drawing evidence from local-case studies and empirical verifications. Reductionistic themes get magnified especially when learners examine different agricultural practices and evaluate their performance efficiencies measured in terms of either energy or dollars. Learning focus in Module 3 dramatically shifts to a holistic plane by alerting learners about different philosophies related to the land, including its sacredness and sanctity as perceived by people of ancient cultures of the world (Haverkort & Hiemstra, 1999). Contemporary trail-blazing Nature-based agricultural management themes discussed by Masanobu Fukuoka and Bill Mollison are used as stimuli. Books by Jared Diamond, Vandana Shiva, and David Suzuki are used to develop a conceptual understanding of holistic-ecological thinking and themes of sustainability.

Reductionism—holism linkage has been demonstrated in agricultural marketing (Fleming, 1990) and extension (Angstreitch & Zinnah, 2007), but not in developing a teaching program.

Conclusion

This paper describes the enabling of systems-based learning in undergraduate students of ecological agriculture. The systems-based learning has been constructed by linking holistic and reductionistic approaches, encouraging learners to bring in a range of empirical questions on the physical world and metaphysical questions on the world beyond physical features. Equipped through several theories, and by reflecting on his/her own work, the learner is challenged to think beyond the scientific framework.

IEA is one subject in BEcoAg. I have referred to *IEA*, an introductory subject, which I designed and am teaching. I have described the novelty attempted in *IEA* by linking two apparently conflicting worldviews to achieve the best from the two. This subject is in offering since 2000 and is well received in each offering. Student feedback has been positive, especially referring to the blend

offered and to the dramatic shift from empirical reductionistic science to abstract holistic philosophy.

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